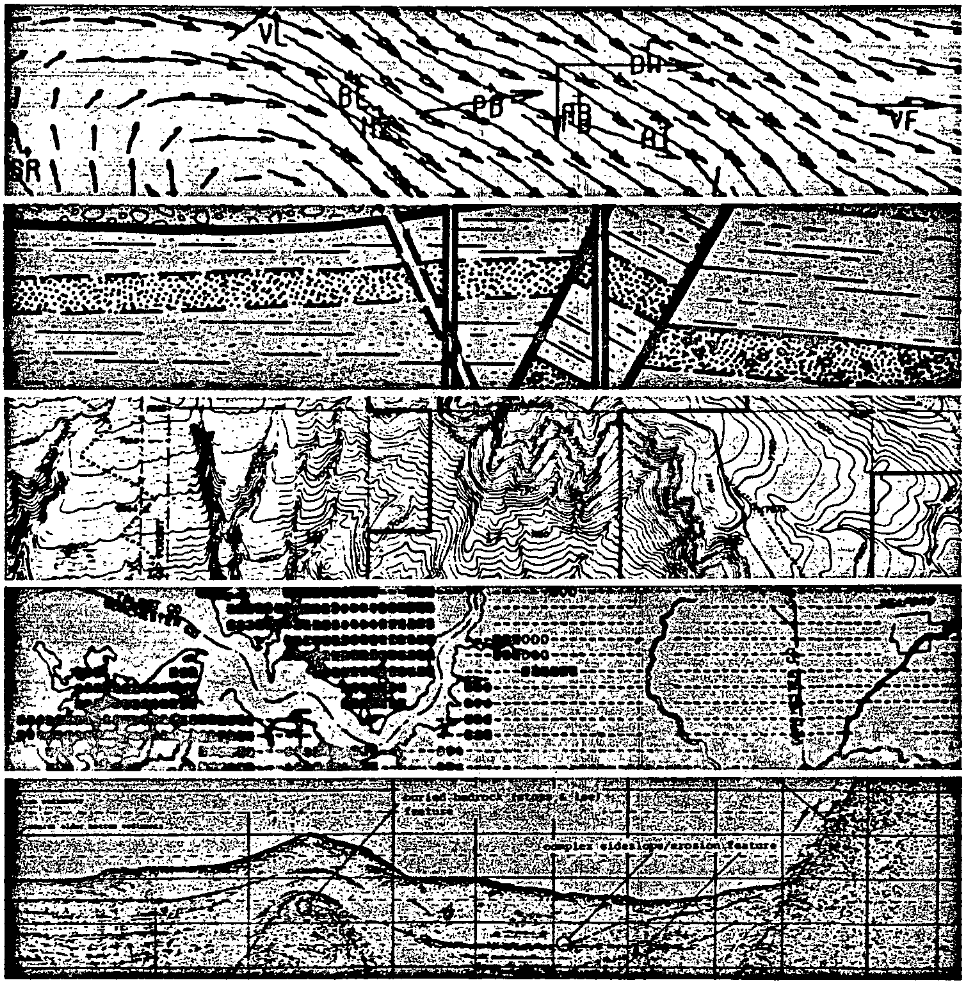

DAMES & MOORE

CALCULATIONS OF GROUND-WATER
DISCHARGE TO PEACH ISLAND CREEK
FORMER SCP SITE
CARLSTADT, NEW JERSEY

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DAMES & MOORE

CRANFORD, NEW JERSEY

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CALCULATIONS OF GROUND-WATER DISCHARGE TO PEACH ISLAND CREEK

FORMER SCP SITE, CARLSTADT, NEW JERSEY

1.0 INTRODUCTION

This study was undertaken to provide supplemental hydrologic information for the RI/FS of the former SCP site in Carlstadt, New Jersey. In particular, it was desired to evaluate to what extent ground water in the surficial layer at the site (the water-table aquifer) may be discharging into Peach Island Creek, thus affecting the latter's water quality.

To perform this analysis, we organized and reduced data from two sources. Data from nearby USGS stream-gaging stations were collected to obtain estimates of mean flow and low flow in Peach Island Creek. At the same time, site water-level and permeability data for the water-table aquifer were combined to compute likely rates of flow into the creek. A second method of estimating ground-water discharge to the creek involved a computation based on the decline in static water levels during a two-week period in April 1988.

Using the estimated stream flows and the computed ground-water discharge quantities, along with the appropriate concentrations for selected parameters known to be present in the stream, we computed the average expected concentration of each parameter in the stream just downstream of the site. These values were then compared with the measured values. The effects of reducing the assigned mean permeability of a sector of the water-table aquifer on the resulting computed stream concentrations were noted.

The following sections describe in detail the method of analysis used and the results obtained.

2.0 ESTIMATION OF FLOW IN PEACH ISLAND CREEK

Runoff records from U.S.G.S. gaging stations located upstream on the Hackensack River Basin were obtained from References 1 and 3. These have been tabulated in Table 1, along with the flow quantities computed for Peach Island Creek just upstream of the site.

As shown in the table, long-term average flow rates were available only from the three continuous-recording stations on the Hackensack Basin, two of which (01377000 and 01377500) represent flow unaffected by control or diversion immediately upstream. On the other hand, ten partial-record stations are available on the basin to provide estimates of low flow. In this case, we desired the standard 7-day 10-year low flow, estimates of which were provided for each station in Reference 3.

Each station's low flow and mean average flow (where available) were converted to a unit area basis (per square mile), as shown in Table 1. The size of the catchment area for Peach Island Creek upstream of the SCP site was obtained by planimetering within the estimated catchment boundary, which is shown on Figure 1. The boundary was drawn on the basis of land-surface contours shown on the 7-1/2-minute topo, being guided by the location of tributaries to Peach Island Creek given on Plate 7 of the 1987 Master Plan of the Borough of Carlstadt. The planimetered area was 0.498 square miles, or approximately 0.5 mi^2. Then the stream flow at the site was estimated by:

$$\text{Est. Flow at Site} = \frac{\text{(Flow at Gaged Station)}}{\text{(Drainage Area of Gaged Station)}} \times \text{(Drainage Area at Site)} \quad (1)$$

By averaging the results from all the stations, Table 1 shows that the average 7-day, 10-year low flow [Q(7/10)] at the upstream end of the site is estimated to be 0.096 cubic feet per second (cfs) while the median is 0.081 cfs. The estimated mean flow based on only two continuous-record stations is 0.845 cfs.

3.0 CALCULATION OF AQUIFER TRANSMISSIVITIES

For the purpose of assigning permeability or transmissivity values, the site area was divided up into seven zones, corresponding to the seven shallow monitoring wells (MW-1S through MW-7S). Each of these zones, shown on Figure 2, is assumed to have the permeability computed at its respective shallow well based on slug-test results. The zones were delineated by using the Thiessen polygon method, normally applied to rainfall data for obtaining basin-wide averages (Ref. 6).

The next step was the computation of transmissivities at each shallow well, for each of three selected monitoring periods--July 1987, March 7, 1988, and April 25, 1988. As the shallow wells monitor the water-table aquifer, aquifer transmissivity will vary as the thickness of the saturated unit varies from time to time. Transmissivity is equal to the product of the estimated horizontal permeability and the saturated thickness.

As shown in Table 2, the horizontal permeability and the elevation of the bottom of the water-table aquifer remain constant, while the elevation of the water table, the saturated thickness, and of course, the transmissivity vary with time. The horizontal permeabilities used represented the results from the rising-head slug tests. The falling-head cases were ignored because of the fact that the static level in each well was within the well screen; and in such cases, computations based on falling-head tests are not ordinarily relied upon. The computed transmissivities at each shallow well for each monitoring period are shown on the table.

With the exception of Wells MW-1S and MW-5S, the computed transmissivities fell within one order of magnitude, 5 to 42 ft^2/day. Much higher values were obtained at Well MW-1S (239 to 269 ft^2/day) and at Well MW-5S (592 to 624 ft^2/day). These high values are functions of the high estimated horizontal permeability at these two wells, 33.2 and 100.9 ft/day, respectively.

4.0 FLOW-NET ANALYSIS

The first of two methods employed to estimate the rate of ground-water discharge into Peach Island Creek involved a flow-net analysis. Water-table contours were drawn for each of the three monitoring periods selected--July 1987, March 7, 1988, and April 25, 1988--and bounding and representative flow lines were drawn, as shown, respectively, on Figures 3, 4 and 5.

The bounding flow lines shown on the figures were drawn to coincide as closely as possible with the boundary lines separating the three permeability zones (5S, 6S, and 7S) that border Peach Island Creek. These bounding flow lines then served as the boundaries to flow sectors discharging into the creek each of which had permeabilities associated with one zone. Figures 3, 4 and 5 show that Sector A is associated with Zone 5S, Sector B with Zone 6S and Sector C with Zone 7S. In the case of Sector A, the transmissivity(T) associated with Zone 5S was not taken alone, but rather an average for the sector was computed from Zones 3S, 4S and 5S, through which flow in the sector passes. In computing the average T value for Sector A, an harmonic mean was calculated, since the flow passes into Zone 5S only after passing through Zones 3S and 4S.

The representative flow lines shown in Figures 3, 4 and 5 represent the average flow lines for each given flow sector. The average length of the flow path and the average gradient for each sector were computed from the representative flow line.

Calculation sheets are included in the Appendix which detail the calculation of ground-water discharge in the direction of Peach Island Creek for each sector at each selected monitoring period. Discharge was computed by the equation:

$$Q = (w)(T)(i) \tag{2}$$

where, Q is the flow discharging in ft^3/day, w is the average width of the flow sector, T is the mean transmissivity in ft^2/day, and i is the gradient over the flow segment considered. A summary of the results of the flow-net analysis as estimated discharge quantities in ft^3/day is given as follows:

Period	Sector A	Sector B	Sector C	Total
July, 1987	117.9	138.9	56.0	312.8
March 7, 1988	117.5	117.1	39.6	274.2
April 25, 1988	41.2	68.7	36.2	146.1

It is clear from this summary that while the computed discharge quantities for July 1987 and March 7, 1988, could represent average discharge conditions, the discharge quantity for April 25, 1988, represents a low-discharge condition, one that might occur only after a number of days of less-than-normal precipitation. Meteorological data for the Newark International airport indicate that for the seven-week period from March 7 to April 25, 1988, a total of 1.75 inches of rainfall fell, which was well below the normal rainfall for the

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period. March and April 1988 taken together had rainfalls totally 4.10 inches, which was 3.62 inches below normal for the two-month period (Ref. 5).

For the purpose of computing ground-water contaminant contributions to the creek at the site, we matched the July 1987 discharge figures with average flow conditions for Peach Island Creek. And the April 25, 1988, ground-water discharge figures were combined with the mean (or median) 7-day, 10-year low flow condition to compute stream concentrations under those conditions. Discussion of these calculations is provided in Section 6.0.

In this area, the average discharge of the water-table aquifer to streams should represent fairly closely the average recharge to the aquifer from precipitation. Assuming that the computed July 1987 ground-water discharge rate at the site is roughly equal to the average ground-water recharge at the site, we computed the average recharge to be 4.2 inches/year. This is based on the 312.8 ft^3/day discharge rate calculated for July 1987 and an assumed ground-water catchment area at the site of 330,000 ft^2 (600 ft x 550 ft). The figure of 4.2 inches per year may be compared with the ground-water recharge estimate by Jablonski (Ref. 4) for Monmouth County of 11.5 inches/year or greater. And Barksdale, et al (Ref. 2) reported that baseflow measurements on South Jersey streams resulted in estimates of ground-water recharge on the order of 12 inches/year. It is quite likely that ground-water recharge in the Hackensack River basin is substantially less than that evidenced in South Jersey where more permeable Pleistocene- and Miocene-age deposits are generally exposed at the surface. Thus, the 4.2 inches estimate for recharge is at least a reasonable one.

5.0 DISCHARGE CALCULATIONS BASED ON DECLINE OF STATIC WATER LEVELS

Ground-water discharge to the creek was also estimated by computations based on the decline in ground-water levels in site shallow wells and piezometers over a selected period. The period selected was from April 11 to April 25, 1988. Within this two-week period, the total precipitation falling at Newark airport was only 0.41 inches (Ref. 5). The fall in ground-water levels should represent the fact that ground water over the period discharged to the creek, although some portion of the ground water lost could have been discharged to

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the atmosphere by evaporation. In our calculations, we assumed that the ground-water recharge derived from the small amount of rainfall received over the period was equal to the amount of ground water lost to evaporation over the period.

Table 3 shows the results of calculations performed for each shallow well or piezometer at the site. The computed discharge shown in the far right-hand column was computed by:

$$Q = (\Delta WT)(A)(S_y)/\Delta t \tag{3}$$

where, Q is the computed discharge in ft^3/day to the creek, ΔWT is the decline in the water table over the period in feet, A is the estimated size of the catchment area in square feet, S_y is the estimated specific yield of the water-table aquifer materials, as a decimal, and Δt is the number of days in the period. As shown on the table, we estimated the catchment size to be 330,000 ft^2 (600 ft x 550 ft), and the average specific yield to be 0.15.

Table 3 shows that there was a wide range in the computed discharge to the creek based on the decline in water levels at each well or piezometer--35 to 2,616 ft^3/day. The average computed discharge was 1,330 ft^3/day which had an estimate for the standard deviation of 777 ft^3/day. We computed a simple arithmetic average based on all the shallow wells and piezometers because the wells and piezometers were reasonably well-distributed over the site. Now, 1,330 ft^3/day on an annual basis represents a recharge rate 17.6 inches/year, about 4.25 times that computed by means of the flow-net analysis. We believe that the mean rate of discharge computed from the decline in water levels is too high to be typical of average annual discharge. Hence, in the calculations described in the following section we utilized only the computed discharge rates derived from the flow-net analysis.

6.0 STREAM CONCENTRATION CALCULATIONS

The results of stream-flow estimation and ground-water flow-net analysis were combined to obtain computed predictions of the concentration of selected parameters in Peach Island Creek just downstream of the site. The following

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chemical parameters were selected for evaluation on the basis that they have been already detected in creek-water samples: chlorobenzene, chloroform, 1,2-dichloroethane, methylene chloride, toluene, 1,2-trans-dichloroethylene, 1,1,1-trichloroethane, trichloroethylene, methyl ethyl ketone, m-xylene, o- + p-xylenes, total copper and total zinc. The data utilized and the results of the calculations are given in Tables 4 through 8.

Tables 4 and 5 relate to the use of the ground-water discharge figures computed from the flow-net analysis as presented in Section 4.0. Table 4 provides the data used in the calculation as well as the computed downstream concentration for each parameter. Table 5 is a summary table which shows both the actual concentrations at the downstream station as well as the computed downstream concentrations.

The calculations associated with Tables 6 and 7 utilize the discharge values from the flow-net analysis for Sectors A and B, while using a discharge value for Sector C which is only five percent of that computed by the flow-net analysis.

Table 8 provides a "back-calculation" version of Tables 4 and 6, in which ground-water concentrations computed by trial and error resulted in downstream concentrations meeting surface-water criteria.

In all cases, the computed downstream concentrations were calculated as follows:

$$C_{ds} = [C_A Q_A + C_B Q_B + C_C Q_C + C_{us} Q_{us}]/[2(Q_A + Q_B + Q_C) + Q_{us})] \quad (4)$$

where, C_{ds} is the computed concentration just downstream of the site,

- C_A is the average concentration in the ground water discharging through Sector A,
- Q_A is the discharge rate through Sector A,
- C_B is the average concentration in the ground water discharging through Sector B,
- Q_B is the discharge rate through Sector B,
- C_C is the average concentration in the ground water discharging through Sector C,
- Q_C is the discharge rate through Sector C,

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C_{us} is the concentration of the parameter in the stream just upstream of the site, and

Q_{us} is the estimated flow in the stream just upstream of the site.

Built into Equation (4) is the assumption that ground water is discharging to Peach Island Creek from the north side of the creek at a rate equal to that from the south side, and that the concentration of each of the selected parameters in that ground water is zero.

As noted in Tables 4 through 7, in making the calculations the average stream flow in Peach Island Creek was combined with the ground-water discharge rate computed for July of 1987 and with the surface-water and ground-water concentrations for the parameters in July of 1987. This was because we assumed that the July 1987 discharge rate more or less represented the year-around average ground-water discharge to the creek. Also as indicated in the tables, C_A was taken as the average concentration of that found in Wells MW-4S and MW-5S, C_B was the concentration at Well MW-6S, and C_C was the concentration at Well MW-7S.

In the case of low flow, the estimated 7-day, 10-year low flow for the creek was combined with the ground-water discharge rate computed for April 25, 1988 and with the surface-water and ground-water concentrations for the parameters in December 1987. The value used for the 7-day, 10-year low flow was the median value (0.081 cfs, or 6,998 ft^3/day) obtained from the twelve continuous- and partial-record gaging stations on the Hackensack basin. No water-quality data subsequent to December 1987 were available, so the December 1987 data was utilized for the low-flow condition. As noted earlier, we believe that the computed ground-water discharge for April 25, 1988, represents nearly dry-weather ground-water flow at the site.

Comparison of the last two columns in Table 5 indicate that the computational scheme over-predicted the concentration of the selected parameters immediately downstream of the site. Significant over-prediction occurred in the case of methylene chloride, toluene, trichloroethylene, methyl ethyl ketone, and total copper. This is shown in the following summary:

PARAMETER	AVERAGE-FLOW CONDITIONS Computed Downstream Conc. (µg/l)	Actual Downstream Conc. (µg/l)	LOW-FLOW CONDITIONS Computed Downstream Conc. (µg/l)	Actual Downstream Conc. (µg/l)
Methylene Chloride	167.1	ND	664.3	12.9
Toluene	58.6	ND	350.1	48.1
Trichloroethylene	122.4	ND	716.2	ND
Methyl Ethyl Ketone	1521.0	ND	5795.6	49.2
Total Copper	39.7	BMDL	96.1	27.0

This degree of over-prediction prompted a second set of calculations wherein the discharge from Sector C was assumed to be only five percent of the computed amount. This was a convenient way to reduce the average concentrations for Sector C by a factor of 20. It was felt that the concentrations evidenced in well MW-7S may be too high to be representative of ground water discharging in Sector C. The results of these calculations are provided in Tables 6 and 7. As shown in Table 7, the computed downstream concentrations are now much closer to the measured concentrations. However, over-prediction still occurred, but to a lesser degree, in the case of methylene chloride, toluene, trichloroethylene, methyl ethyl ketone, and total copper, as shown in the following summary:

PARAMETER	AVERAGE-FLOW CONDITIONS Computed Downstream Conc. (µg/l)	Actual Downstream Conc. (µg/l)	LOW-FLOW CONDITIONS Computed Downstream Conc. (µg/l)	Actual Downstream Conc. (µg/l)
Methylene Chloride	22.6	ND	41.9	12.9
Toluene	23.5	ND	103.3	48.1
Trichloroethylene	6.1	ND	46.6	ND
Methyl Ethyl Ketone	76.2	ND	372.9	49.2
Total Copper	39.7	BMDL	97.0	27.0

One reason why the computed concentrations may be larger than actual is that the method of calculations used to compute discharge did not include the capacity of the water-table aquifer materials or the creek-bottom sediments to adsorb chemical species or hold them on the cation-exchange complex. The other reason for the over-prediction, as noted above, could be that some of the shallow monitoring wells, such as MW-7S, are located in "hot spots," where the concentration of the parameters, such as those in the above table, is much higher than what occurs on the average throughout the sector represented by the well.

The results of the 'back-calculation' approach are given in Table 8. This involved a series of trial and error calculations wherein values for ground-water concentration were modified until the resulting downstream concentration in the stream was at the surface-water quality criterion. For those parameters lacking such criteria, an arbitrary value of 1.0 µg/l was applied for the downstream concentration. For the sake of simplicity, it was assumed that for each parameter each sector would have the same ground-water concentration . In all cases it was assumed that the upstream concentrations were zero.

As shown in the table, for all the organics a maximum concentration of 230 µg/l in the water-table aquifer could be tolerated during periods of average flow in the creek, while only 50 µg/l would be acceptable during low-flow periods. In the case of copper, a concentration of 680 µg/l in the water-table aquifer would be allowed during average flow conditions, and 145 µg/l during low flow. For the case of zinc, ground-water concentrations of 22,350 µg/l would be acceptable under average flow conditions, while this would be reduced to 4,730 µg/l in the case of low flow.

7.0 CONCLUSIONS

The analysis involved many uncertainties, most important among them being the unknown magnitude of the flow in the creek under average and low-flow conditions, and the extent to which the creek sediments and the water-table aquifer materials could hold-back the chemical parameters by adsorption and cation exchange. Nevertheless, we believe that the analysis indicates in a realistic way the magnitude of likely ground-water discharge to Peach Island Creek and provides the likely upper bound of contaminant concentrations in the creek which could result from the discharge.

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TABLE 1

PERTINENT FLOW RECORDS FOR USGS CONTINUOUS-RECORDING STATIONS IN THE HACKENSACK RIVER BASIN
FORMER SCP SITE, CARLSTADT, NJ

STATION NUMBER	TRIBUTARY TO	STREAM GAGED	LOCATION	LAT/LONG	DIST. TO SITE (MI)	DRAINAGE AREA (SQ. MI.)	7-DAY, 10-YR LOW FLOW (CFS)	7-DAY, 10-YR LOW FLOW PER SQ. MI. (CFS)	EST. 7-DAY 10-YR LOW FLOW AT SITE (CFS)	AVG FLOW AT STATION (CFS)	ESTIMATED AVG FLOW AT SITE (CFS)
01377000	NEWARK BAY	HACKENSACK	4.6 MI UPSTRM OF ORADELL DAM IN RIVERVALE	40°59'55"; 73°59'27"	12.9 NNE	58.00	7.30 10.00**	0.13	0.063	88.7	0.76
01377500	HACKENSACK	PASCACK BR.	75 FT UPSTRM FROM HARRINGTON AVE, WESTWOOD	40°59'33"; 74°01'19"	12.2 NNE	29.60	8.30	0.28	0.140	55.2	0.93
01378500	NEWARK BAY	HACKENSACK	4.0 MI DOWNSTRM OF PASCACK BR, NEW MILFORD	40°56'52"; 74°01'34"	9.1 NNE	113.00	0.0 *	0.00	--	99.5	0.44

PERTINENT FLOW RECORDS FOR USGS PARTIAL-RECORD LOW-FLOW STATIONS IN THE HACKENSACK RIVER BASIN

STATION NUMBER	TRIBUTARY TO	STREAM GAGED	LOCATION	LAT/LONG	DIST. TO SITE (MI)	DRAINAGE AREA (SQ. MI.)	7-DAY, 10-YR LOW FLOW (CFS)	7-DAY, 10-YR LOW FLOW PER SQ. MI. (CFS)	EST. 7-DAY 10-YR LOW FLOW AT SITE (CFS)	AVG FLOW AT STATION (CFS)	ESTIMATED AVG FLOW AT SITE (CFS)
01377475	PASCACK BR.	MUSQUAPSINK	CULVERT ON PASCACK RD, WASHINGTON BORO	40°59'41"; 74°03'42"	12.0 N	2.12	0.50	0.24	0.118	NA	NA
01378350	HACKENSACK	TENAKILL BR.	BRIDGE ON MADISON AVENUE, CRESSKILL, NJ	40°56'30"; 73°57'52"	10.3 NNE	3.01	1.20	0.40	0.199	NA	NA
01378385	HACKENSACK	TENAKILL BR.	BRIDGE ON HIGH STREET IN CLOSTER	40°58'29"; 73°58'06"	11.8 NNE	8.56	2.70	0.32	0.158	NA	NA
01378410	TENAKILL BR.	DWARS KILL	BRIDGE ON BLANCHE AVE., NORWOOD	40°59'01"; 73°57'35"	12.35 NNE	4.23	0.30	0.07	0.035	NA	NA
01378430	TENAKILL BR.	TENAKILL TRIB.	BRIDGE ON BLANCHE AVE., NORWOOD	40°59'06"; 73°57'39"	12.9 NNE	2.03	0.30	0.15	0.074	NA	NA
01378520	HACKENSACK	HIRSHFELD BR.	BRIDGE ON BOULEVARD IN NEW MILFORD	40°56'49"; 74°01'00"	9.0 N	4.54	0.70	0.15	0.077	NA	NA
01378530	HACKENSACK	FRENCH BROOK	BRIDGE ON NEW BRIDGE RD IN NEW BRIDGE	40°55'00"; 74°01'25"	6.9 NNE	0.46	0.10	0.22	0.109	NA	NA
01378560	HACKENSACK	COLES BROOK	BRIDGE ON MAIN ST. IN HACKENSACK	40°54'40"; 74°02'26"	6.25 NNE	7.00	0.80	0.11	0.057	NA	NA
01378590	OVERPECK CR.	METZLER BROOK	ON LANTANA AVE. IN ENGLEWOOD	40°54'29"; 73°59'13"	7.35 NE	1.54	0.1	0.06	0.032	NA	NA
01378615	BELLMANS CR.	WOLF CREEK	CLARK AVENUE IN RIDGEFIELD	40°49'45"; 74°00'14"	3.55 ENE	1.18	0.2	0.17	0.085	NA	NA
								AVG Q (7/10) =	0.096	MEAN AVG Q=	0.845
								MEDIAN Q(7/10) =	0.081		
								MAXIMUM VALUE =	0.199		
								MINIMUM VALUE =	0.032		

* CONTROL AND DIVERSION IS IMMEDIATELY UPSTREAM
** LOW FLOW AFTER REGULATION IN EFFECT

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TABLE 2

SHALLOW MONITORING-WELL DATA AND TRANSMISSIVITY ESTIMATES

FORMER SCP SITE, CARLSTADT, NJ

MONITORING WELL NO.	HORIZONTAL PERMEABILITY, FROM SLUG TESTS (FT/DAY)	ELEV. OF BOTTOM OF W. T. AQUIFER (FT)	FOR JULY 1987			FOR MARCH 7 1988			FOR APRIL 25 1988		
			ELEV. OF WATER TABLE (FT)	SATURATED THICKNESS (FT)	COMPUTED TRANSMISSIVITY (SQ FT/DAY)	ELEV. OF WATER TABLE (FT)	SATURATED THICKNESS (FT)	COMPUTED TRANSMISSIVITY (SQ FT/DAY)	ELEV. OF WATER TABLE (FT)	SATURATED THICKNESS (FT)	COMPUTED TRANSMISSIVITY (SQ FT/DAY)
MW-1S	33.2	-1.35	6.49	7.84	260	6.74	8.1	269	5.86	7.2	239
MW-2S	4.1	-0.57	5.51	6.08	25	6.04	6.6	27	5.23	5.8	24
MW-3S	1.1	-8.00	4.90	12.9	14	4.70	12.7	14	3.84	11.8	13
MW-4S	5.5	-1.18	6.40	7.58	42	6.50	7.7	42	5.43	6.6	36
MW-5S	100.9	-2.56	3.53	6.09	614	3.62	6.2	624	3.31	5.9	592
MW-6S	7.0	-1.38	2.85	4.23	30	2.67	4.0	28	2.61	4.0	28
MW-7S	0.5	-4.40	5.91	10.31	5	5.31	9.7	5	5.41	9.8	5

TABLE 3

CALCULATION OF GROUND-WATER DISCHARGE BASED ON AVERAGE DECLINE OF STATIC WATER LEVELS AT SITE

WELL ID	STATIC W.T. ON 4/11/88 (FT. ABOVE M.S.L.)	STATIC W.T. ON 4/25/88 (FT. ABOVE M.S.L.)	W.T. DECLINE OVER PERIOD (FT)	APPROX. SIZE OF CATCHMENT (SQ. FT.)	ESTIMATED SPECIFIC YIELD	NO. OF DAYS IN PERIOD	COMPUTED DISCHARGE TO CREEK (CU FT/DAY)
P-1	6.61	6.00	0.61	330,000	0.15	14	2156.79
P-2	5.69	5.15	0.54	330,000	0.15	14	1909.29
P-3	5.03	4.62	0.41	330,000	0.15	14	1449.64
P-4	7.24	6.77	0.47	330,000	0.15	14	1661.79
P-5	2.91	2.90	0.01	330,000	0.15	14	35.36
P-6	6.24	5.70	0.54	330,000	0.15	14	1909.29
P-7	5.64	5.26	0.38	330,000	0.15	14	1343.57
P-8	6.46	5.79	0.67	330,000	0.15	14	2368.93
P-9	5.47	4.88	0.59	330,000	0.15	14	2086.07
P-10	5.03	4.68	0.35	330,000	0.15	14	1237.50
P-11	5.90	5.37	0.53	330,000	0.15	14	1873.93
P-12	1.82	1.69	0.13	330,000	0.15	14	459.64
P-13	3.38	3.11	0.27	330,000	0.15	14	954.64
P-14	3.69	3.56	0.13	330,000	0.15	14	459.64
MW-1S	6.46	5.86	0.60	330,000	0.15	14	2121.43
MW-2S	5.55	5.23	0.32	330,000	0.15	14	1131.43
MW-3S	4.11	3.84	0.27	330,000	0.15	14	954.64
MW-4S	6.17	5.43	0.74	330,000	0.15	14	2616.43
MW-5S	3.54	3.31	0.23	330,000	0.15	14	813.21
MW-6S	2.64	2.61	0.03	330,000	0.15	14	106.07
MW-7S	5.49	5.41	0.08	330,000	0.15	14	282.86
						AVERAGE:	1330.10
						STD. DEVIATION:	777.49

001873

TABLE 4

COMPUTATION OF DOWNSTREAM CONCENTRATIONS IN PEACH ISLAND CREEK FOR AVERAGE FLOW CONDITIONS

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	ESTIMATED UPSTREAM AVERAGE FLOW IN CU FT/DAY (Qus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	73,008	BMDL	117.9	BMDL	138.9	ND	56.0	0.0
CHLOROFORM	ND	73,008	ND	117.9	ND	138.9	6,460	56.0	4.9
1,2-DICHLOROETHANE	ND	73,008	ND	117.9	ND	138.9	16,300	56.0	12.4
METHYLENE CHLORIDE	10.6	73,008	2,763.5	117.9	33.5	138.9	200,000	56.0	167.1
TOLUENE	ND	73,008	13,355	117.9	120	138.9	48,600	56.0	58.6
1,2-TRANS-DICHLOROETHYLENE	8.46	73,008	4,850	117.9	326	138.9	64,700	56.0	66.0
1,1,1-TRICHLOROETHANE	5.42	73,008	ND	117.9	ND	138.9	37,200	56.0	33.7
TRICHLOROETHYLENE	ND	73,008	ND	117.9	ND	138.9	161,000	56.0	122.4
METHYL ETHYL KETONE	ND	73,008	ND	117.9	ND	138.9	2,000,000	56.0	1521.0
M-XYLENE	ND	73,008	1,810	117.9	ND	138.9	BMDL	56.0	2.9
O + P-XYLENES	ND	73,008	1,460	117.9	257	138.9	ND	56.0	2.8
TOTAL COPPER	40	73,008	7	117.9	ND	138.9	60	56.0	39.7
TOTAL ZINC	160	73,008	17	117.9	BMDL	138.9	100	56.0	158.7

COMPUTATION OF DOWNSTREAM CONCENTRATIONS IN PEACH ISLAND CREEK FOR LOW-FLOW CONDITIONS

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	EST. UPSTREAM MEDIAN 7-DAY 10-YR LOW FLOW IN CU FT/DAY (Qus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	6,998	2,070.5	41.2	BMDL	68.7	ND	36.2	11.7
CHLOROFORM	ND	6,998	ND	41.2	ND	68.7	ND	36.2	0.0
1,2-DICHLOROETHANE	ND	6,998	44.9	41.2	ND	68.7	ND	36.2	0.3
METHYLENE CHLORIDE	4.63	6,998	730	41.2	34.9	68.7	132,000	36.2	664.3
TOLUENE	BMDL	6,998	15,660	41.2	97.2	68.7	52,500	36.2	350.1
1,2-TRANS-DICHLOROETHYLENE	ND	6,998	4,725	41.2	1140	68.7	ND	36.2	37.4
1,1,1-TRICHLOROETHANE	ND	6,998	465.5	41.2	ND	68.7	ND	36.2	2.6
TRICHLOROETHYLENE	ND	6,998	1,915	41.2	31.8	68.7	142,000	36.2	716.2
METHYL ETHYL KETONE	75	6,998	2,385	41.2	ND	68.7	1,150,000	36.2	5795.6
M-XYLENE	ND	6,998	920	41.2	BMDL	68.7	ND	36.2	5.2
O + P-XYLENES	ND	6,998	875	41.2	304	68.7	ND	36.2	7.8
TOTAL COPPER	100	6,998	17.5	41.2	BMDL	68.7	BMDL	36.2	96.1
TOTAL ZINC	370	6,998	25	41.2	22	68.7	36	36.2	355.7

NOTES: IN THE UPPER TABLE, THE ESTIMATED AVERAGE STREAM FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK IN JULY 1987 AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN JULY 1987.

IN THE LOWER TABLE, THE ESTIMATED 7-DAY, 10-YR LOW FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK FOR APRIL 25, 1988, AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN DECEMBER 1987.

TABLE 5

SUMMARY OF RESULTS OF DILUTION CALCULATIONS FOR PEACH ISLAND CREEK UNDER AVERAGE FLOW CONDITIONS

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)	ACTUAL CONC. AT SW-2 JUST DOWNSTREAM OF SITE IN UG/L
CHLOROBENZENE	ND	BMDL	BMDL	ND	0.0	ND
CHLOROFORM	ND	ND	ND	6,460	4.9	BMDL
1,2-DICHLOROETHANE	ND	ND	ND	16,300	12.4	5.27
METHYLENE CHLORIDE	10.6	2,763.5	33.5	200,000	167.1	ND
TOLUENE	ND	13,355	120	48,600	58.6	ND
1,2-TRANS-DICHLOROETHYLENE	8.46	4,850	326	64,700	66.0	6.69
1,1,1-TRICHLOROETHANE	5.42	ND	ND	37,200	33.7	BMDL
TRICHLOROETHYLENE	ND	ND	ND	161,000	122.4	ND
METHYL ETHYL KETONE	ND	ND	ND	2,000,000	1521.0	ND
M-XYLENE	ND	1,810	ND	BMDL	2.9	ND
O + P-XYLENES	ND	1,460	257	ND	2.8	ND
TOTAL COPPER	40	7	ND	60	39.7	BMDL
TOTAL ZINC	160	17	BMDL	100	158.7	49

SUMMARY OF RESULTS OF DILUTION CALCULATIONS FOR PEACH ISLAND CREEK UNDER LOW-FLOW CONDITIONS

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)	ACTUAL CONC. AT SW-2 JUST DOWNSTREAM OF SITE IN UG/L
CHLOROBENZENE	ND	2,070.5	BMDL	ND	11.7	12.2
CHLOROFORM	ND	ND	ND	ND	0.0	3.56
1,2-DICHLOROETHANE	ND	44.9	ND	ND	0.3	15.3
METHYLENE CHLORIDE	4.63	730	34.9	132,000	664.3	12.9
TOLUENE	BMDL	15,660	97.2	52,500	350.1	48.1
1,2-TRANS-DICHLOROETHYLENE	ND	4,725	1140	ND	37.4	33.3
1,1,1-TRICHLOROETHANE	ND	465.5	ND	ND	2.6	5.54
TRICHLOROETHYLENE	ND	1,915	31.8	142,000	716.2	ND
METHYL ETHYL KETONE	75	2,385	ND	1,150,000	5795.6	49.2
M-XYLENE	ND	920	BMDL	ND	5.2	10.7
O + P-XYLENES	ND	875	304	ND	7.8	10.0
TOTAL COPPER	100	17.5	BMDL	BMDL	96.1	27
TOTAL ZINC	370	25	22	36	355.7	150

NOTES: IN THE UPPER TABLE, THE ESTIMATED AVERAGE STREAM FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK IN JULY 1987 AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN JULY 1987.

IN THE LOWER TABLE, THE ESTIMATED 7-DAY, 10-YR LOW FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK FOR APRIL 25, 1988, AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN DEC 87.

TABLE 6

COMPUTATION OF DOWNSTREAM CONCENTRATIONS IN PEACH ISLAND CREEK FOR AVERAGE FLOW CONDITIONS
(SECTOR C DISCHARGE REDUCED BY A FACTOR OF 20)

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	ESTIMATED UPSTREAM AVERAGE FLOW IN CU FT/DAY (Qus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	73,008	BMDL	117.9	BMDL	138.9	ND	2.8	0.0
CHLOROFORM	ND	73,008	ND	117.9	ND	138.9	6,460	2.8	0.2
1,2-DICHLOROETHANE	ND	73,008	ND	117.9	ND	138.9	16,300	2.8	0.6
METHYLENE CHLORIDE	10.6	73,008	2,763.5	117.9	33.5	138.9	200,000	2.8	22.6
TOLUENE	ND	73,008	13,355	117.9	120	138.9	48,600	2.8	23.5
1,2-TRANS-DICHLOROETHYLENE	8.46	73,008	4,850	117.9	326	138.9	64,700	2.8	19.3
1,1,1-TRICHLOROETHANE	5.42	73,008	ND	117.9	ND	138.9	37,200	2.8	6.8
TRICHLOROETHYLENE	ND	73,008	ND	117.9	ND	138.9	161,000	2.8	6.1
METHYL ETHYL KETONE	ND	73,008	ND	117.9	ND	138.9	2,000,000	2.8	76.2
M-XYLENE	ND	73,008	1,810	117.9	ND	138.9	BMDL	2.8	2.9
O + P-XYLENES	ND	73,008	1,460	117.9	257	138.9	ND	2.8	2.8
TOTAL COPPER	40	73,008	7	117.9	ND	138.9	60	2.8	39.7
TOTAL ZINC	160	73,008	17	117.9	BMDL	138.9	100	2.8	158.9

COMPUTATION OF DOWNSTREAM CONCENTRATIONS IN PEACH ISLAND CREEK FOR LOW-FLOW CONDITIONS
(SECTOR C DISCHARGE REDUCED BY A FACTOR OF 20)

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	EST. UPSTREAM MEDIAN 7-DAY 10-YR LOW FLOW IN CU FT/DAY (Qus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	6,998	2,070.5	41.2	BMDL	68.7	ND	1.8	11.8
CHLOROFORM	ND	6,998	ND	41.2	ND	68.7	ND	1.8	0.0
1,2-DICHLOROETHANE	ND	6,998	44.9	41.2	ND	68.7	ND	1.8	0.3
METHYLENE CHLORIDE	4.63	6,998	730	41.2	34.9	68.7	132,000	1.8	41.9
TOLUENE	BMDL	6,998	15,660	41.2	97.2	68.7	52,500	1.8	103.3
1,2-TRANS-DICHLOROETHYLENE	ND	6,998	4,725	41.2	1140	68.7	ND	1.8	37.8
1,1,1-TRICHLOROETHANE	ND	6,998	465.5	41.2	ND	68.7	ND	1.8	2.7
TRICHLOROETHYLENE	ND	6,998	1,915	41.2	31.8	68.7	142,000	1.8	46.6
METHYL ETHYL KETONE	75	6,998	2,385	41.2	ND	68.7	1,150,000	1.8	372.9
M-XYLENE	ND	6,998	920	41.2	BMDL	68.7	ND	1.8	5.2
O + P-XYLENES	ND	6,998	875	41.2	304	68.7	ND	1.8	7.9
TOTAL COPPER	100	6,998	17.5	41.2	BMDL	68.7	BMDL	1.8	97.0
TOTAL ZINC	370	6,998	25	41.2	22	68.7	36	1.8	358.9

NOTES: (1) IN THE UPPER TABLE, THE ESTIMATED AVERAGE STREAM FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK IN JULY 1987 AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN JULY 1987

(2) IN THE LOWER TABLE, THE ESTIMATED 7-DAY, 10-YR LOW FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK FOR APRIL 25, 1988, AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN DECEMBER 1987

TABLE 7

SUMMARY OF RESULTS OF DILUTION CALCULATIONS FOR PEACH ISLAND CREEK UNDER AVERAGE FLOW CONDITIONS
(SECTOR C DISCHARGE REDUCED BY A FACTOR OF 20)

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)	ACTUAL CONC. AT SW-2 JUST DOWNSTREAM OF SITE IN UG/L
CHLOROBENZENE	ND	BMDL	BMDL	ND	0.0	ND
CHLOROFORM	ND	ND	ND	6,460	0.2	BMDL
1,2-DICHLOROETHANE	ND	ND	ND	16,300	0.6	5.27
METHYLENE CHLORIDE	10.6	2,763.5	33.5	200,000	22.6	ND
TOLUENE	ND	13,355	120	48,600	23.5	ND
1,2-TRANS-DICHLOROETHYLENE	8.46	4,850	326	64,700	19.3	6.69
1,1,1-TRICHLOROETHANE	5.42	ND	ND	37,200	6.8	BMDL
TRICHLOROETHYLENE	ND	ND	ND	161,000	6.1	ND
METHYL ETHYL KETONE	ND	ND	ND	2,000,000	76.2	ND
M-XYLENE	ND	1,810	ND	BMDL	2.9	ND
O + P-XYLENES	ND	1,460	257	ND	2.8	ND
TOTAL COPPER	40	7	ND	60	39.7	BMDL
TOTAL ZINC	160	17	BMDL	100	158.9	49

SUMMARY OF RESULTS OF DILUTION CALCULATIONS FOR PEACH ISLAND CREEK UNDER LOW-FLOW CONDITIONS
(SECTOR C DISCHARGE REDUCED BY A FACTOR OF 20)

CHEMICAL PARAMETER	UPSTREAM CONC. IN UG/L (Cus)	SECTOR A GROUND-WATER CONC. IN UG/L [WELLS 4S & 5S] (Ca)	SECTOR B GROUND-WATER CONC. IN UG/L [WELL 6S] (Cb)	SECTOR C GROUND-WATER CONC. IN UG/L [WELL 7S] (Cc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)	ACTUAL CONC. AT SW-2 JUST DOWNSTREAM OF SITE IN UG/L
CHLOROBENZENE	ND	2,070.5	BMDL	ND	11.8	12.2
CHLOROFORM	ND	ND	ND	ND	0.0	3.56
1,2-DICHLOROETHANE	ND	44.9	ND	ND	0.3	15.3
METHYLENE CHLORIDE	4.63	730	34.9	132,000	41.9	12.9
TOLUENE	BMDL	15,660	97.2	52,500	103.3	48.1
1,2-TRANS-DICHLOROETHYLENE	ND	4,725	1140	ND	37.8	33.3
1,1,1-TRICHLOROETHANE	ND	465.5	ND	ND	2.7	5.54
TRICHLOROETHYLENE	ND	1,915	31.8	142,000	46.6	ND
METHYL ETHYL KETONE	75	2,385	ND	1,150,000	372.9	49.2
M-XYLENE	ND	920	BMDL	ND	5.2	10.7
O + P-XYLENES	ND	875	304	ND	7.9	10.0
TOTAL COPPER	100	17.5	BMDL	BMDL	97.0	27
TOTAL ZINC	370	25	22	36	358.9	150

NOTES: (1) IN THE UPPER TABLE, THE ESTIMATED AVERAGE STREAM FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK IN JULY 1987 AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN JULY 1987.
(2) IN THE LOWER TABLE, THE ESTIMATED 7-DAY, 10-YR LOW FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND WATER DISCHARGE TO THE CREEK FOR APRIL 25, 1988, AND WITH THE SURFACE-WATER AND GROUND-WATER CONCENTRATIONS IN DEC 87.

TABLE 8

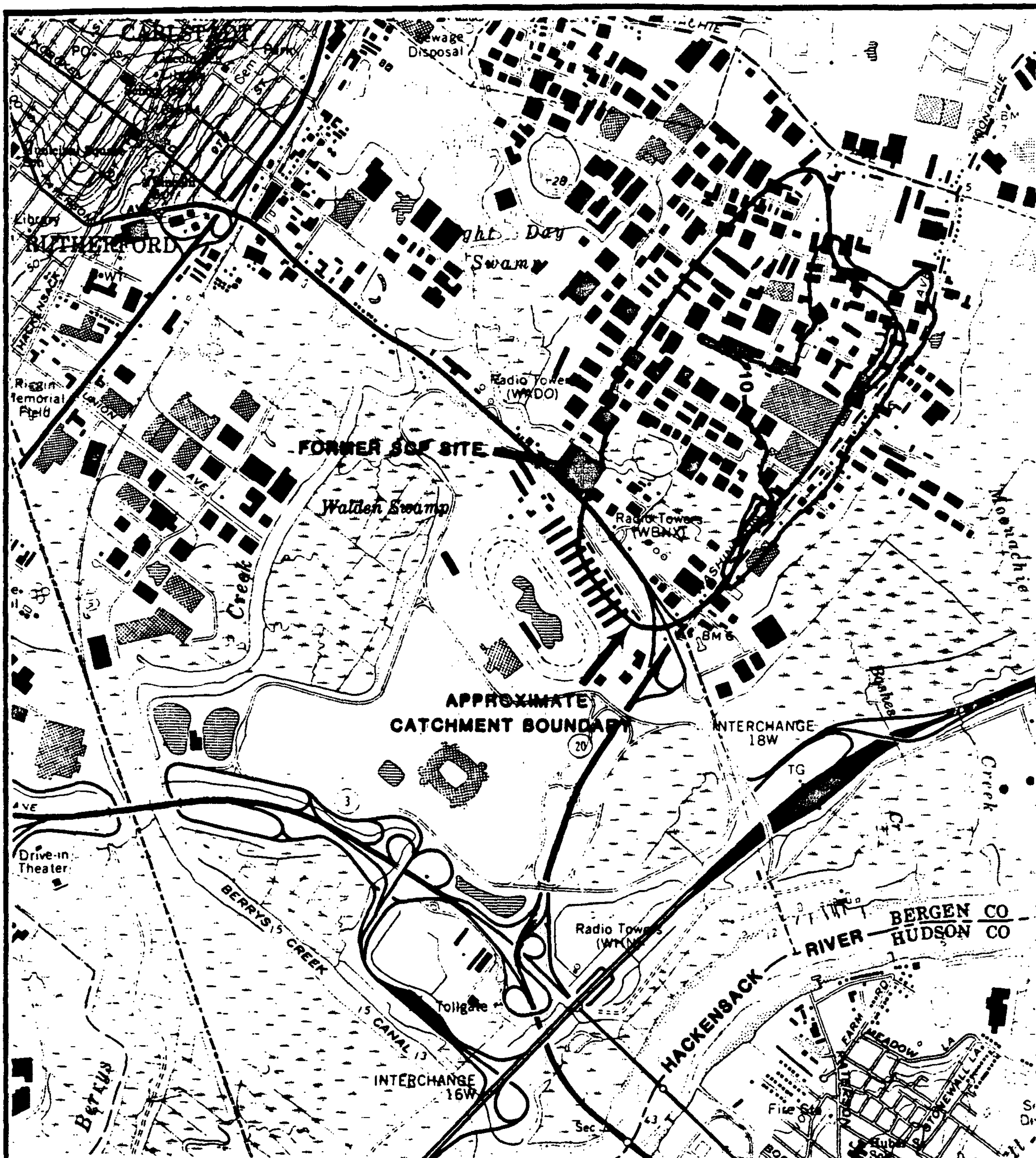
ESTIMATION OF MAXIMUM GROUND-WATER CONCENTRATIONS IN WATER TABLE FOR AVERAGE STREAM-FLOW CONDITIONS
(BASED ON SURFACE-WATER QUALITY CRITERIA FOR PEACH ISLAND CREEK)

CHEMICAL PARAMETER	ASSUMED UPSTREAM CONC. IN UG/L (Cus)	ESTIMATED UPSTREAM AVERAGE FLOW IN CU FT/DAY (Qus)	ASSUMED SECTOR A GROUND-WATER CONC. IN UG/L (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	ASSUMED SECTOR B GROUND-WATER CONC. IN UG/L (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	ASSSUMED SECTOR C GROUND-WATER CONC. IN UG/L (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
CHLOROFORM	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
1,2-DICHLOROETHANE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
METHYLENE CHLORIDE	0	73,008	230	117.9	230	138.9	230	56.0	1.0
TOLUENE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
1,2-TRANS-DICHLOROETHYLENE	0	73,008	230	117.9	230	138.9	230	56.0	1.0
1,1,1-TRICHLOROETHANE	0	73,008	230	117.9	230	138.9	230	56.0	1.0
TRICHLOROETHYLENE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
METHYL ETHYL KETONE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
M-XYLENE	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
O + P-XYLENES	ND	73,008	230	117.9	230	138.9	230	56.0	1.0
TOTAL COPPER	0	73,008	680	117.9	680	138.9	680	56.0	2.9
TOTAL ZINC	0	73,008	22,350	117.9	22,350	138.9	22,350	56.0	94.9

ESTIMATION OF MAXIMUM GROUND-WATER CONCENTRATIONS IN WATER TABLE FOR LOW STREAM-FLOW CONDITIONS
(BASED ON SURFACE-WATER QUALITY CRITERIA FOR PEACH ISLAND CREEK)

CHEMICAL PARAMETER	ASSUMED UPSTREAM CONC. IN UG/L (Cus)	EST. UPSTREAM MEDIAN 7-DAY 10-YR LOW FLOW IN CU FT/DAY (Qus)	ASSUMED SECTOR A GROUND-WATER CONC. IN UG/L (Ca)	SECTOR A GROUND-WATER DISCHARGE IN CU FT/DAY (Qa)	ASSUMED SECTOR B GROUND-WATER CONC. IN UG/L (Cb)	SECTOR B GROUND-WATER DISCHARGE IN CU FT/DAY (Qb)	ASSSUMED SECTOR C GROUND-WATER CONC. IN UG/L (Cc)	SECTOR C GROUND-WATER DISCHARGE IN CU FT/DAY (Qc)	COMPUTED DOWN-STREAM CONC. IN UG/L (Cds)
CHLOROBENZENE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
CHLOROFORM	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
1,2-DICHLOROETHANE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
METHYLENE CHLORIDE	0	6,998	50	41.2	50	68.7	50	36.2	1.0
TOLUENE	BMDL	6,998	50	41.2	50	68.7	50	36.2	1.0
1,2-TRANS-DICHLOROETHYLENE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
1,1,1-TRICHLOROETHANE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
TRICHLOROETHYLENE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
METHYL ETHYL KETONE	0	6,998	50	41.2	50	68.7	50	36.2	1.0
M-XYLENE	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
O + P-XYLENES	ND	6,998	50	41.2	50	68.7	50	36.2	1.0
TOTAL COPPER	0	6,998	145	41.2	145	68.7	145	36.2	2.9
TOTAL ZINC	0	6,998	4,730	41.2	4,730	68.7	4,730	36.2	94.8

NOTES: (1) IN THE UPPER TABLE, THE ESTIMATED AVERAGE STREAM FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK IN JULY 1987.
(2) IN THE LOWER TABLE, THE ESTIMATED 7-DAY, 10-YR LOW FLOW IN PEACH ISLAND CREEK IS COMBINED WITH THE COMPUTED GROUND-WATER DISCHARGE TO THE CREEK FOR APRIL 25, 1988.



LOCATION MAP FOR FORMER SCP SITE SHOWING APPROXIMATE BOUNDARY OF SURFACE-WATER CATCHMENT TO PEACH ISLAND CREEK

0 2000 4000 FEET

N

REFERENCE:
U.S.G.S. 7.5' QUADRANGLE:
WEEHAWKEN, N.J.,N.Y.,1967,
PHOTO REVISED 1981

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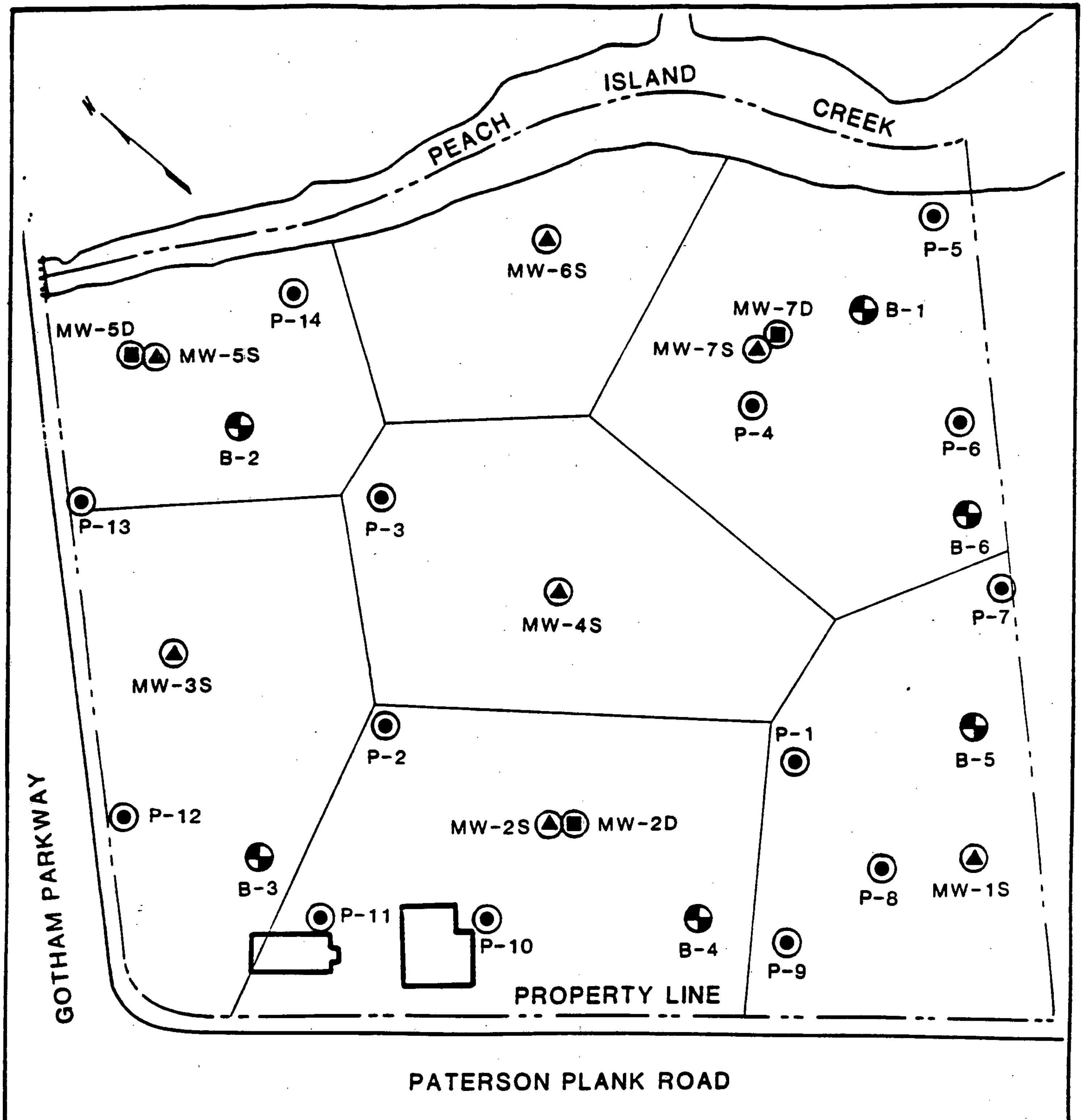
DAMES & MOORE

FIGURE 1



LOCATION PLAN SHOWING ZONES OF ASSUMED EQUAL PERMEABILITY IN WATER-TABLE AQUIFER

FORMER SCP SITE, CARLSTADT, N.J.

KEY:
- SOIL BORING
- SHALLOW PIEZOMETER
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL

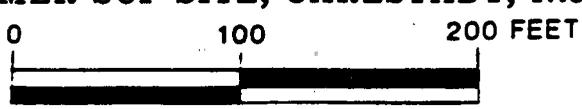


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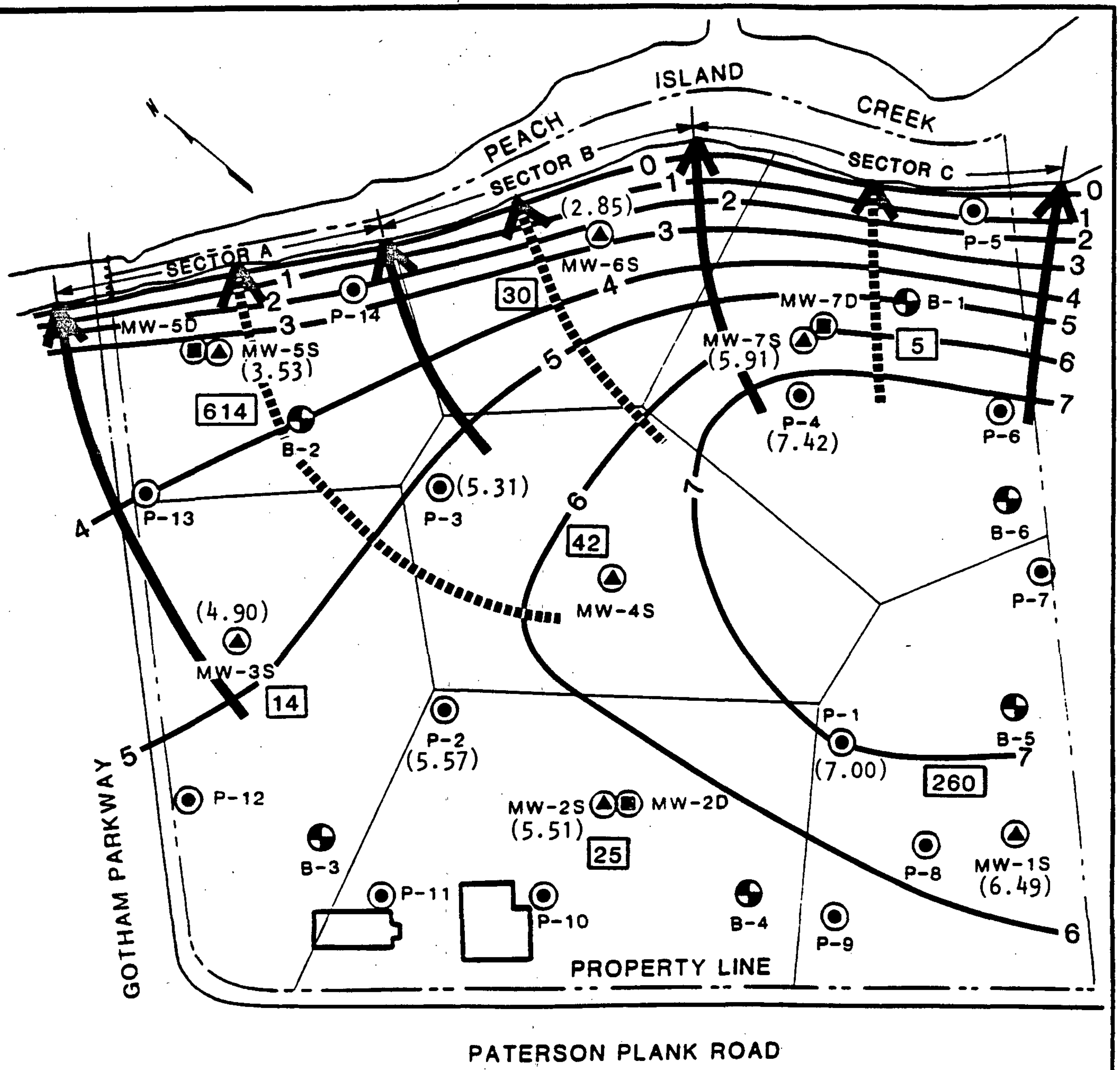
FIGURE 2



KEY:

- SOIL BORING
- SHALLOW PIEZOMETER
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- 42 ESTIMATED TRANSMISSIVITY OF ZONE (ft^2/day)
- BOUNDARY FLOW LINE SEPARATING ADJACENT SECTORS
- REPRESENTATIVE FLOW LINE FOR SECTOR
- 5 WATER-TABLE CONTOUR (FT. ABOVE M.S.L. IN JULY 1987)

GROUND-WATER CONTOURS AND DISCHARGING FLOW PATHS JULY 1987 WATER-TABLE AQUIFER

FORMER SCP SITE, CARLSTADT, N.J.

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0 100 200 FEET

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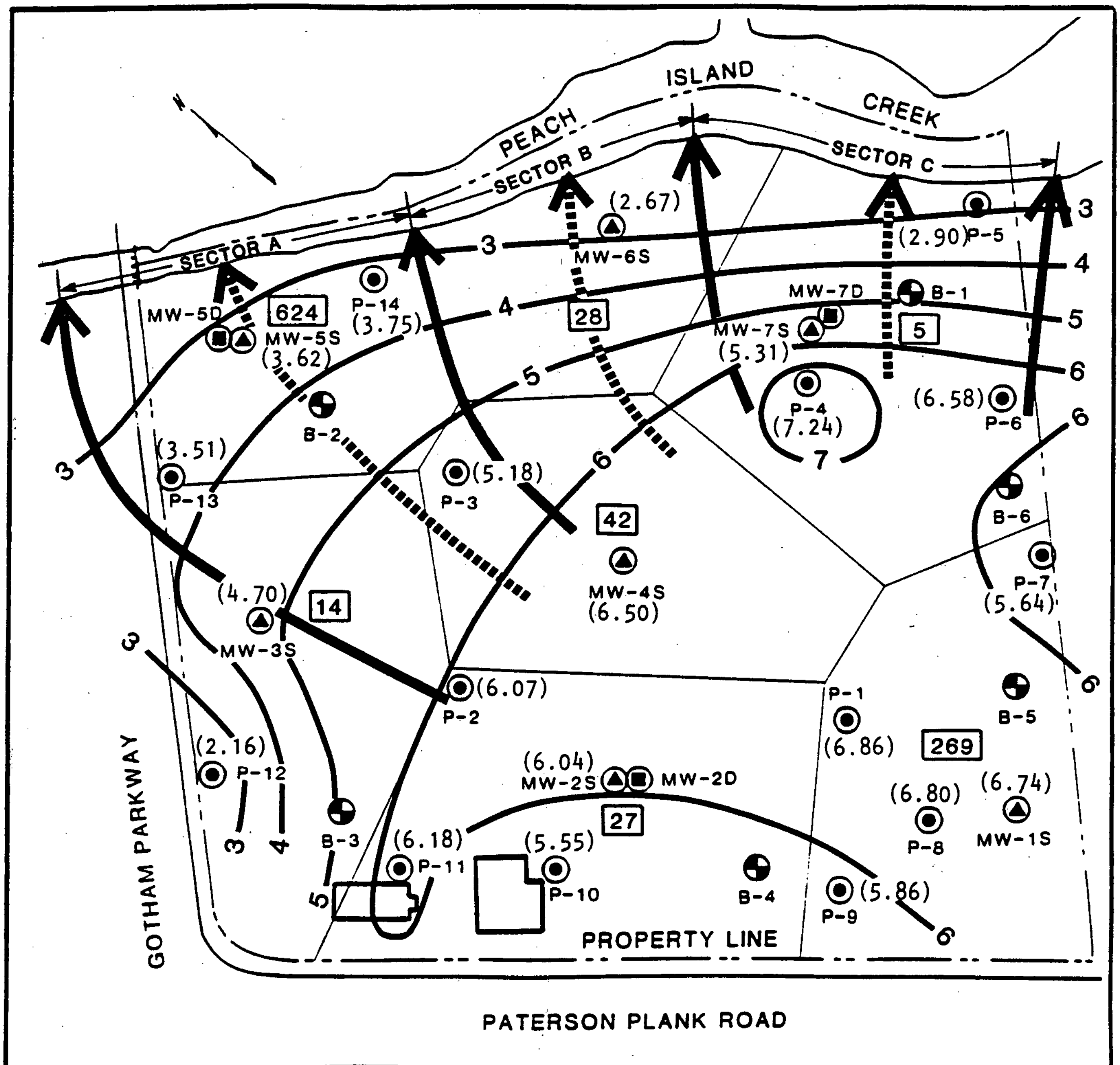
FIGURE 3



KEY:

- SOIL BORING
- SHALLOW PIEZOMETER
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- 14 ESTIMATED TRANSMISSIVITY OF ZONE (ft²/day)
- BOUNDARY FLOW LINE SEPARATING ADJACENT SECTORS
- REPRESENTATIVE FLOW LINE FOR SECTOR
- 5 WATER-TABLE CONTOUR (FT. ABOVE M.S.L. IN JULY 1987)

GROUND-WATER CONTOURS AND DISCHARGING FLOW PATHS MARCH 7, 1988 WATER-TABLE AQUIFER

FORMER SCP SITE, CARLSTADT, N.J.

0 100 200 FEET

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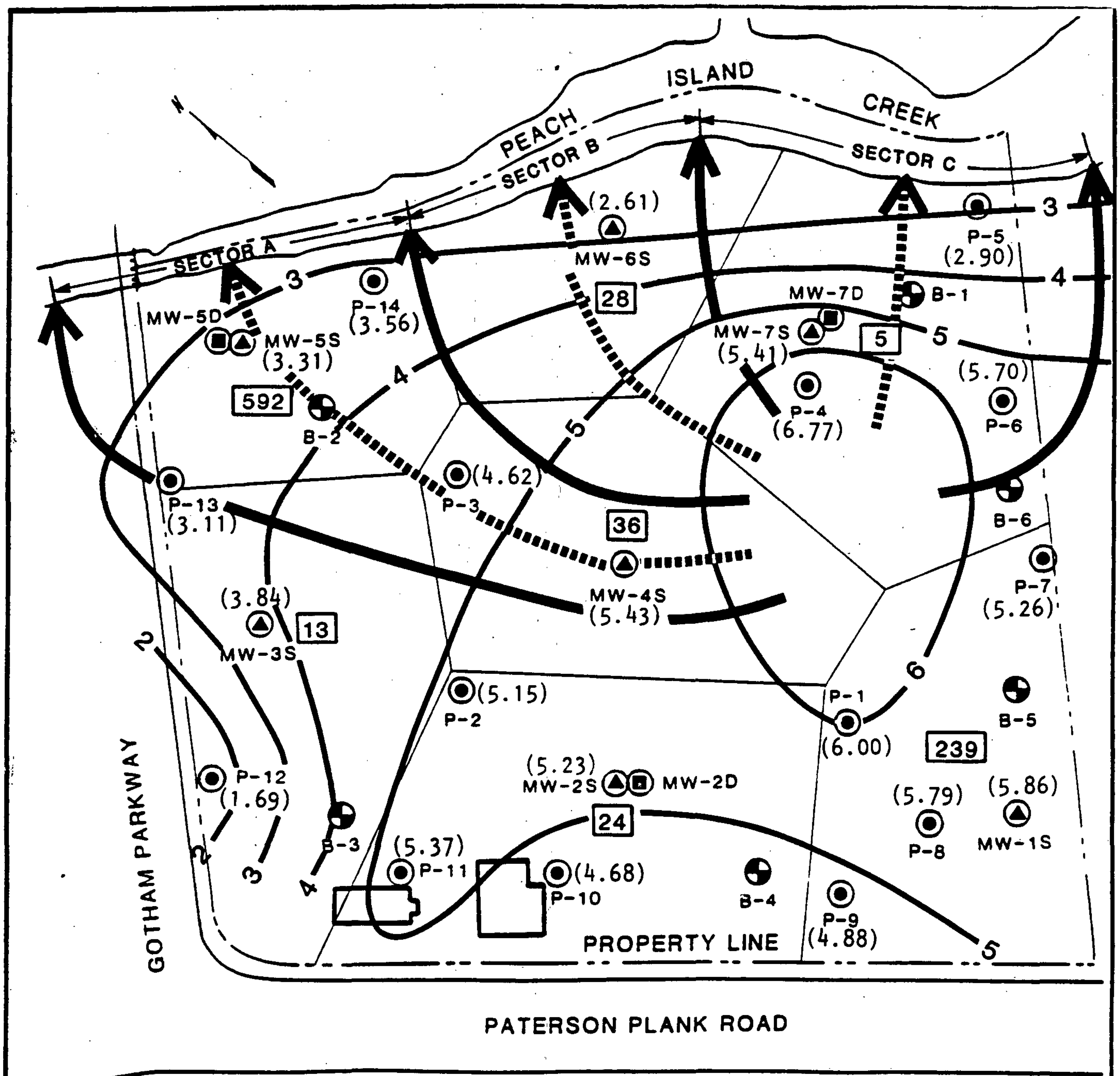
FIGURE 4



KEY:

- SOIL BORING
- SHALLOW PIEZOMETER
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- 36 ESTIMATED TRANSMISSIVITY OF ZONE (ft^2/day)
- BOUNDARY FLOW LINE SEPARATING ADJACENT SECTORS
- REPRESENTATIVE FLOW LINE FOR SECTOR
- 5 WATER-TABLE CONTOUR (FT. ABOVE M.S.L. IN JULY 1987)

GROUND-WATER CONTOURS AND DISCHARGING FLOW PATHS APRIL 25, 1988 WATER-TABLE AQUIFER

FORMER SCP SITE, CARLSTADT, N.J.

0 100 200 FEET

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FIGURE 5

FILE 7425-002 (8009)
SUBJECT
SHEET 1 OF 4

Computation of Discharge to Peach Island Creek - FLOW-NET ANALYSIS

I. JULY 1987 (See Figure 3)

Sector A:

Length of Representative Flow Line from Contour 6 to Contour 3 = 7.8 cm = 254.9 ft

Length of Rep. flow line from Contour 6 to Contour 4.5 = 147.0'

Now, find harmonic mean transmissivity along flow path from Contour 6 to Contour 3

$$\bar{T} = \frac{l_1 + l_2}{\frac{l_1}{T_1} + \frac{l_2}{T_2}}$$

$l_1 = 147'$, $l_2 = 254.9 - 147 = 108'$

$T_1 = \frac{42 + 14}{2} = 28\ ft^2/day$ (Zones 3S + 4S)

$T_2 = 614\ ft^2/day$ (Zone 5S)

$$\bar{T} = \frac{147 + 108}{\frac{147}{28} + \frac{108}{614}} = 47\ ft^2/day$$

$$Q = w\bar{T}i$$

w = avg. width of Sector A flow channel = 209'

$i = \frac{6 - 3}{255'} = 0.012$

$Q = (209')(47\ ft^2/day)(0.012) = \underline{117.9\ ft^3/day}$

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I. July 1987 (Cont.)

Sector B:

Length of Representative Flow Line from Contour 6 to Contour 3 = 114.4 ft

Here, we adopt the T value for Zone 6S (30 ft^2/day) for the entire flow path from Contour 6 to Contour 3.

$$Q = wTi$$
$$= (176.5)(30)\left(\frac{6-3}{114.4}\right) = \underline{138.9\ ft^3/day}$$

Sector C:

Length of Rep. Flow Line from Contour 7 to Contour 2 = 94.8'

Here, T = 5 ft^2/day (as entirely in Zone 7S)

w = 212.4 ft

$$Q = wTi = (212.4)(5)\left(\frac{7-2}{94.8}\right) = \underline{56.0\ ft^3/day}$$

II. March 7, 1988 (See Figure 4)

Sector A:

Length of Rep. flow line from Contour 6 to Contour 3 = 240.2'

w = 196' (avg.)

Compute $\overline{T}$ from l_1, l_2, T_1 & T_2

l_1 = 135.6' from Contour 6 to Contour 4.5

l_2 = 104.6' from Contour 4.5 to Contour 3

$$T_1 = \frac{42+14}{2} = 28\ ft^2/day$$

$$T_2 = 624\ ft^2/day$$

$$\overline{T} = \frac{135.6 + 104.6}{135.6/28 + 104.6/624} = 47.94 \approx \underline{48.0\ ft^2/day}$$

$$Q = w\overline{T}i = (196)(48)\left(\frac{6-3}{240.2}\right) = \underline{117.5\ ft^3/day}$$

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II. March 7, 1988 (cont.)

Sector B:

Length of Rep. Flow line from Contour 6 to Contour 3 = 124.2'

Let $T_{(avg)}$ = 28 ft²/day (the T value for Zone 6S)

$w = 173.2'$

$$Q = wTi = (173.2)(28)\left(\frac{6-3}{124.2}\right) = \underline{\underline{117.1 \text{ ft}^3/\text{day}}}$$

Sector C:

Length of Rep. Flow line from Contour 6 to Contour 3 = 81.7'

T = 5 ft²/day, as entirely in Zone 7S

$w = 215.7$ ft

$$Q = wTi = (215.7)(5)\left(\frac{6-3}{81.7}\right) = \underline{\underline{39.6 \text{ ft}^3/\text{day}}}$$

III. April 25, 1988 (See Figure 5)

Sector A:

Length of Rep. Flow Line from Contour 6 to Contour 3 = 336.6'

W (avg) = 124.0'

Compute $\overline{T}$ from l_1, l_2, T_1 + T_2

$l_1 = 251.6'$ (from Contour 6 to Contour 4)

$l_2 = 336.6 - 251.6 = 85'$

$$T_1 = \frac{36(2) + 13(1)}{2+1} = 28.3 \text{ ft}^2/\text{day}$$

$T_2 = 592$ ft²/day

$$\overline{T} = \frac{251.6 + 85'}{251.6/28.3 + 85/592} = \underline{37.3 \text{ ft}^2/\text{day}}$$

$$Q = w\overline{T}i = (124)(37.3)\left(\frac{6-3}{336.6}\right) = \underline{\underline{41.2 \text{ ft}^3/\text{day}}}$$

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III. April 25, 1988 (cont.)

$\boxed{\text{Sector B}}$

Length of Rep. Flow line from Contour 6 to Contour 3 = 150.3'

Compute $\overline{T} = \dfrac{l_1 + l_2}{l_1/T_1 + l_2/T_2}$

$l_1 = 81.7$

$l_2 = 150.3 - 81.7 = 68.6$ ft

$T_1 = \dfrac{36+5}{2} = 20.5\ ft^2/day$

$T_2 = 28\ ft^2/day$

$\overline{T} = \dfrac{81.7 + 68.6}{81.7/20.5 + 68.6/28} = \underline{23.4\ ft^2/day}$

$Q = w\overline{T}i = (147)(23.4)\left(\dfrac{6-3}{150.3}\right) = \underline{\underline{68.7\ ft^3/day}}$

$\boxed{\text{Sector C:}}$

Length of Rep. Flow line from Contour 6 to Contour 3 = 94.8'

$T = 5\ ft^2/day$, as entirely in Zone 7S

$w = 229'$

$Q = wTi = (229)(5)\left(\dfrac{6-3}{94.8}\right) = \underline{\underline{36.2\ ft^3/day}}$

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